wahlberg
LIGHT & MOTION DESIGN

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DC-Motor Controller

User Manual

Firmware V4.00

Product content

1 Controller box - for controlling a DC-motor.
1 power supply 100 – 240 volt AC/DC adapter, output 24V DC
1 net wire

Functional description

Controlling a DC-motor by DMX signals from a light desk.
The DC-motor is able to run freely without positioning, with regulation of the speed and the direction.
The DC-motor is able to run with positioning, so the motor stops at a certain position.
Positioning run requires a feedback, either from a potentiometer or an impulse.

Overview

DMX Channels

MODE 0 – Free Run
- DMX channel 1 – Stop/Direction
- DMX channel 2 – Not in use
- DMX channel 3 – Speed

MODE 1-6 – Potentiometer
- DMX channel 1 – Position
- DMX channel 2 – Not in use
- DMX channel 3 – Speed

MODE 7-9 – Positioning with impulses (tacho)
- DMX channel 1 – Position coarse
- DMX channel 2 – Position fine
- DMX channel 3 – Speed
- DMX channel 4 – Reset Backward
- DMX channel 5 – Reset Forward

MODE Functions

MODE 0:	Free Run.
MODE 1:	Positioning with potentiometer 1 with slow positioning.
MODE 2:	Positioning with potentiometer 1 with normal positioning.
MODE 3:	Positioning with potentiometer 1 with fast positioning.
MODE 4:	Positioning with potentiometer 2 with slow Positioning.
MODE 5:	Positioning with potentiometer 2 with normal Positioning.
MODE 6:	Positioning with potentiometer 2 with fast Positioning.
MODE 7:	Positioning with tacho with slow Positioning.
MODE 8:	Positioning with tacho with normal Positioning.
MODE 9:	Positioning with tacho with fast Positioning.

Table 1 – Suggestions to mode settings according to Wahlberg products

Wahlberg Product Id	Product type	Mode									
		0	1	2	3	4	5	6	7	8	9
		FR	P1	P1	P1	P2	P2	P2	Imp	Imp	Imp
261	Actuator, 100mm, 20kg			X							
262	Actuator ,100mm, 30kg			X							
263	Actuator, 100mm, 50kg.			X							
264	Actuator, 100mm, 100kg.				X						
265	Actuator, 200mm, 100kg.				X						
266	Actuator, 400mm, 100kg.				X						
267	Actuator, 100mm, 300kg.				X						
268	Actuator, 200mm, 300kg.				X						
269	Actuator, 400mm, 300kg.				X						
272	Door opener		X								
273	Curtain track motor										X
275	DC Motor, 60Rpm, 10 turn				X						
276	DC Motor, 110Rpm, 10 turn				X						

FR = Free Run,
P1 = Potentiometer 1 – XLR - Motor plug.
P2 = Potentiometer 2, - XLR - Motor Feedback plug.
Imp = Tacho Impulses – XLR – Motor Feedback plug.

Settings

DMX address

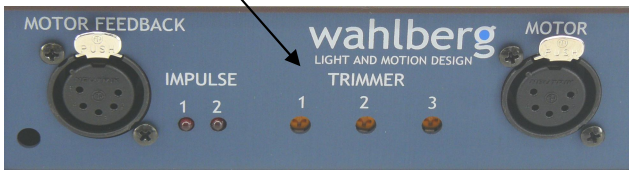
The wanted DMX address is set on the Controller box,
The DMX address states from witch channel on the light desk, the DC- motor is controlled.
The DMX address can be set from 1 to 509.
The controller box uses 3 DMX channels overall.

MODE

The wanted MODE function is set on the controller box.
Each MODE setting states a certain function. (See **MODE functions**).
The MODE can be set from 1 to 9.

Trimmer 1, 2, 3

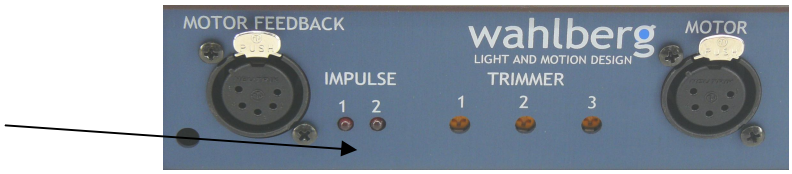
Trimmer 1: Limiting of movement backwards. (Mode 1 – 6).
Trimmer 2: Minimum speed. (Mode 1 – 9)
Trimmer 3: Limiting of movement forward. (Mode 1 – 6).
Trimmer 1 turned left and Trimmer 3 turned right gives the maximum area of movement.



Lamps

Impulse lamps 1, 2

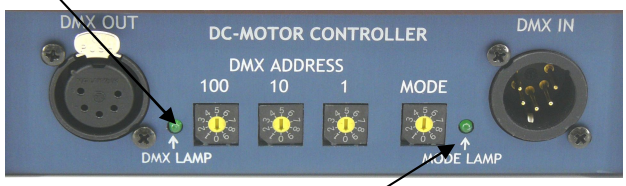
Blinks when impulse is given.



DMX lamp

The DMX lamp indicates the connection status of the DMX signal.

It illuminates when the DMX signal is correctly connected,
and flashes if the DMX signal is wrong or not connected.



MODE lamp

The MODE lamp indicates the run of the motor in the different MODE functions.

MODE 0:

The lamp flashes when the motor runs.
The lamp illuminates when the motor has stopped.

MODE 1 – 6:

The lamp flashes when the motor runs towards a position.
The lamp illuminates when the motor has stopped.

MODE 7 – 9:

The lamp flashes when the motor runs towards a position.
The lamp illuminates when the desired position has been reached and the motor stops.
The lamp flashes even faster if a limit end stop is reached.

Connections.

Power supply

The controller-box is connected to the mains using the 24V power supply.

DMX

The DMX is connected with a 5 pole XLR male plug.
Connections inside the DMX plug: see **Electric connections**.

DC-motor

The DC-motor is connected to the controller-box using a 5 pole XLR male plug.
Connections for the motor: see **Electric connections.** For details of suitable motors: see **DC-motor instruction**.

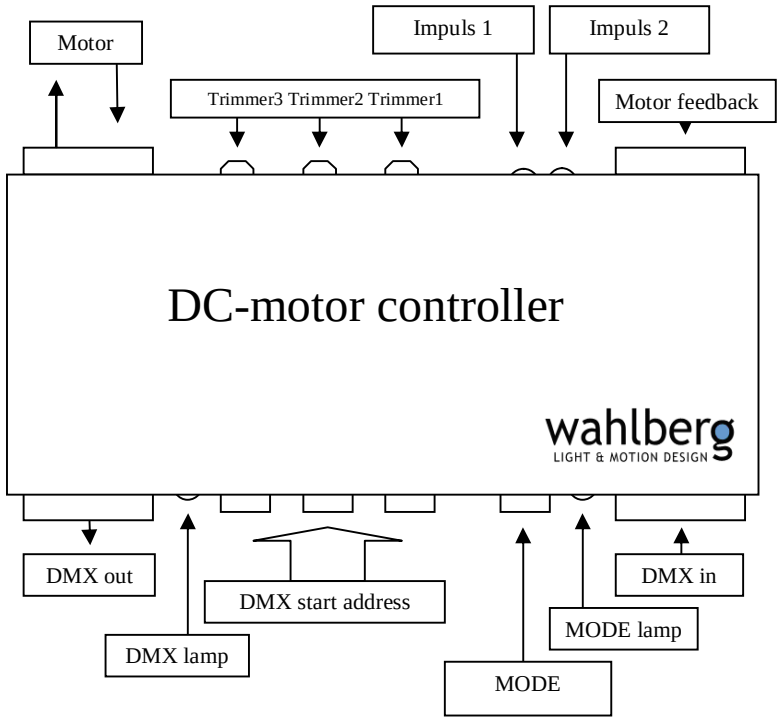
Potentiometer / impulse

A potentiometer or an impulse is connected using a 5 pole XLR male plug.
Potentiometer or impulse is connected according to the desired form of positioning.

The potentiometer gives an easy, cheap and rough exact positioning, while an impulse gives a more precise but relative positioning.
At impulse positioning, the position has to be reset every time the power is connected.

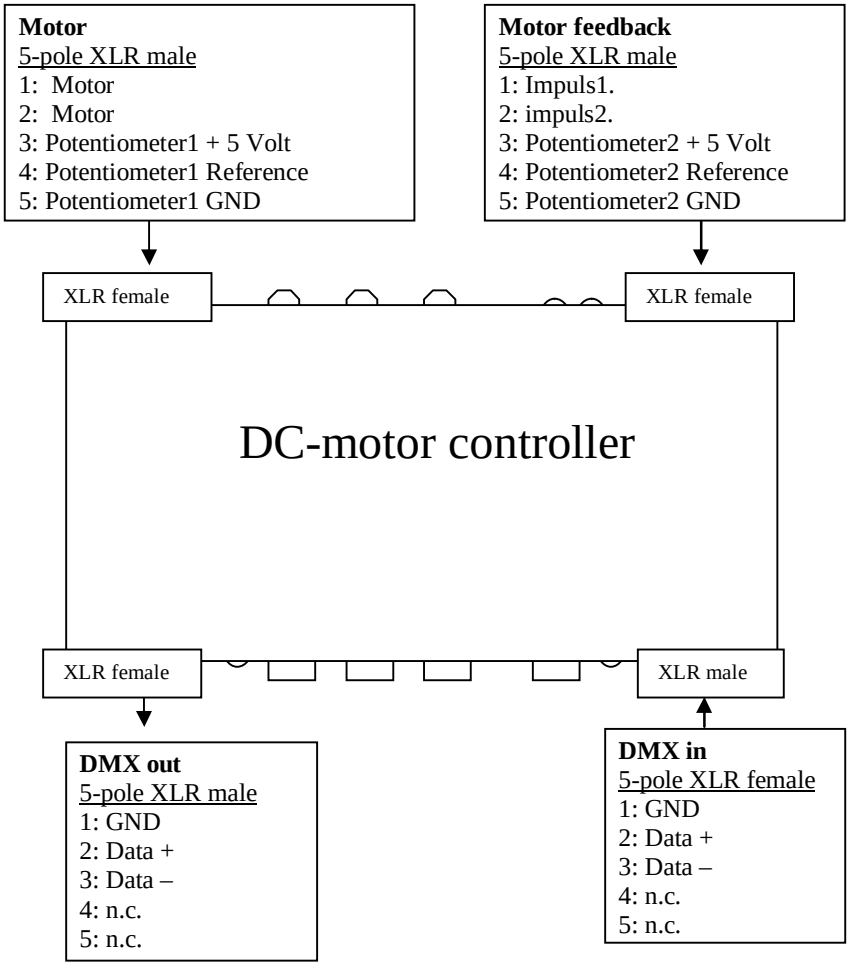
Connections for potentiometer / impulse: see **Electric connection**.

Fig. 1 – Connection overview



Electric connections

Fig. 2 –Connections



DC-motor

The DC-motor is connected to the 5 poled XLR plug marked MOTOR.
The DC-motor has 2 wires, those 2 wires is connected to pins 1 and 2 in the plug.

If the motor is to be used to positioning runs, it is important that the motor is connected in such a way that it runs forward when the controller box gives the forward signal, and vice versa.
If the running direction is wrong, switch the wires on pins no. 1 and 2 in the motor plug, or switch the wires on the motor.

Depending on the motor type in use "forward and backwards" might as well be "up and down" or "north/south". Forward and backwards is just used as a name for the running direction.

To test if the motor connection has been made correctly according to the controller box, go through one of the following test routines:

Test routine with DMX

The motor wires are connected to the XLR male plug on pin 1 and 2.
The XLR plug is connected to the motor plug in the controller box (MOTOR).
The MODE-selector is set at MODE 0.
DMX is connected.
The DMX channel 1 is set at 100%.
The DMX channel 3 is set at 50%.
The motor should now run **forward**, with 50% speed.
The DMX channel 1 is set at 0%
The DMX channel 3 is still set at 50%.
The motor should now run **backwards**, with 50% speed.
If the direction of the movement of the motor is not correct, e.g. the motor does not run forward when the controller box believe it does, the motor wires must be switched between pin 1 and 2 in the XLR plug.

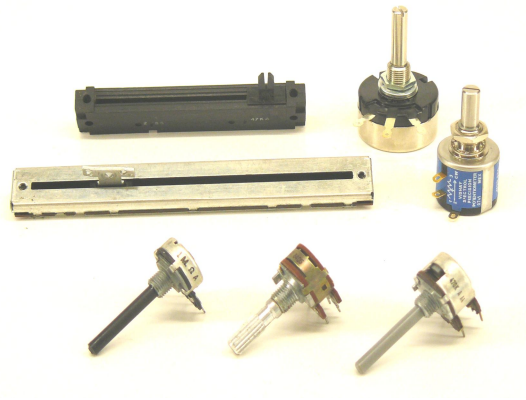
Potentiometer / impulse

To use the motor positioning, it is necessary to have some kind of reference, so the controller knows where the motor is at.
The reference can be made either with a potentiometer or an impulse.
The reference must be mechanically connected to the motor, so the reference moves as the motor is running.
Read more in the passage **Mechanical connections**.

Potentiometer as a reference.

The controller box has 2 inputs for positioning from a potentiometer:
Input 1 is in the motor plug (pin4).
Input 2 is in the motor feedback plug (pin 4).
Both inputs do the same, but allow you to connect the potentiometer in different ways.
See details under the **Potentiometer connections** section.
It is possible to use a number of different potentiometers, the potentiometer just need to comply with the motor you want to use, so you can get the best possible utilisation of the motor positioning.
The value should be within 1-10Kohm
Examples of potentiometers:

3 turn - 5 turn -10 turn
360° turn - Liner potentiometer



Potentiometer connections

The potentiometer connections are important in relation to the run of the motor.
When the DC-motor is correctly connected and its directions of movement are defined, the potentiometer should be connected. The potentiometer is connected to the pins 3, 4 and 5 either in the motor plug or in the motor feedback plug, depending of mode. **See fig. 4 and 5**

There are two ways of testing whether the potentiometer is correctly connected, in relation to the direction of the movement. It is important to note that the potentiometer should not be in an outer position when testing this. The potentiometer should instead be set in a middle position, to avoid destroying it, if the connections are wrong.
Mount the potentiometer in such a way that the arm / shaft moves forward and backwards when the motor runs forward and backwards.

Test:

1) Before connecting the potentiometer to the controller box MOTOR plug or MOTOR FEEDBACK plug:
   Measure the resistance in ohm between the potentiometer centre pin (2) and outer pin (3).
   When the motor is running forward the ohm-value should decrease.
   At the same time the ohm-value should increase between the centre pin and the other outer pin (1).
   The outer pin (3) of the potentiometer is connected to pin 3 in the plug, the centre pin (1) to pin 4 and the last pin to pin 5. If the direction of the movement is the other way around pin 3 and 5 should be switched.

2) After the potentiometer is connected to the controller box:
   Measure the voltage between pin 4 and 5 (+ on pin 4 and – on pin 5). The voltage should go towards 5 volts when the motor is running forward and decrease when the motor is running backwards.

Fig. 3 – Potentiometer connections

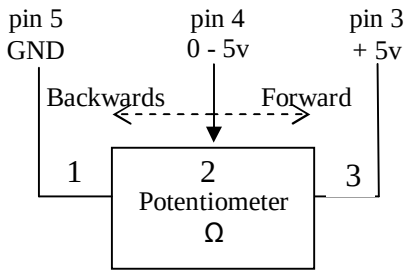


Fig. 4 – Potentiometer connections in the MOTOR plug

Connection of a potentiometer to the MOTOR plug.
Used at positioning in mode 1 – 2 – 3.

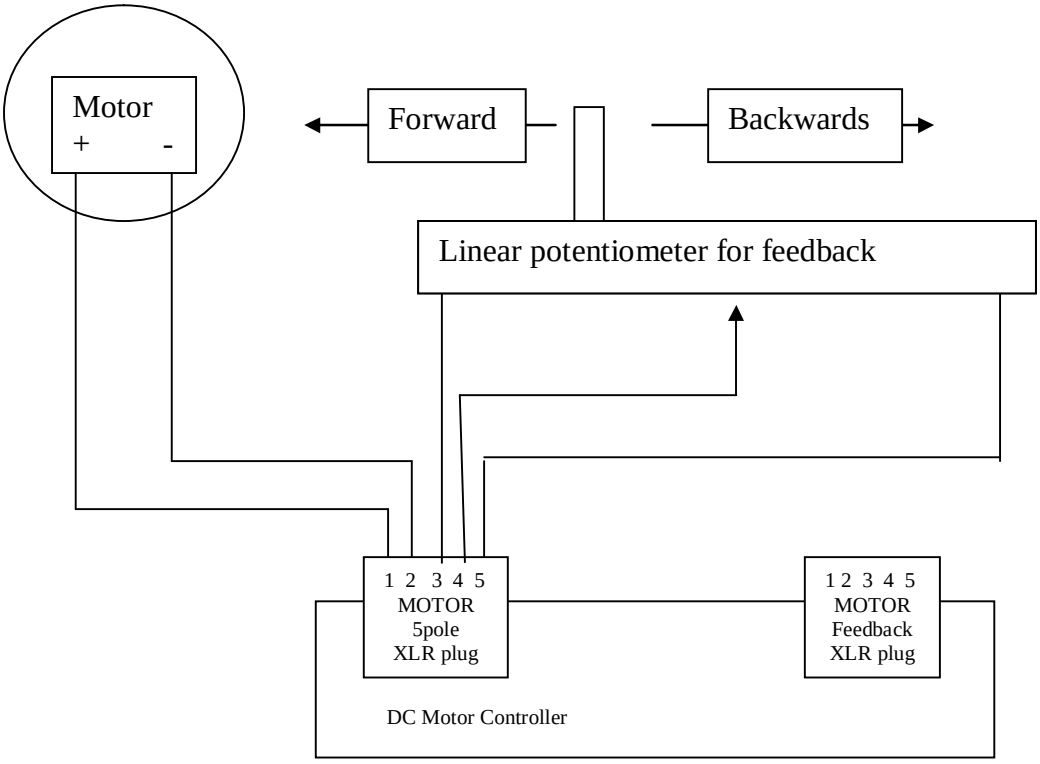
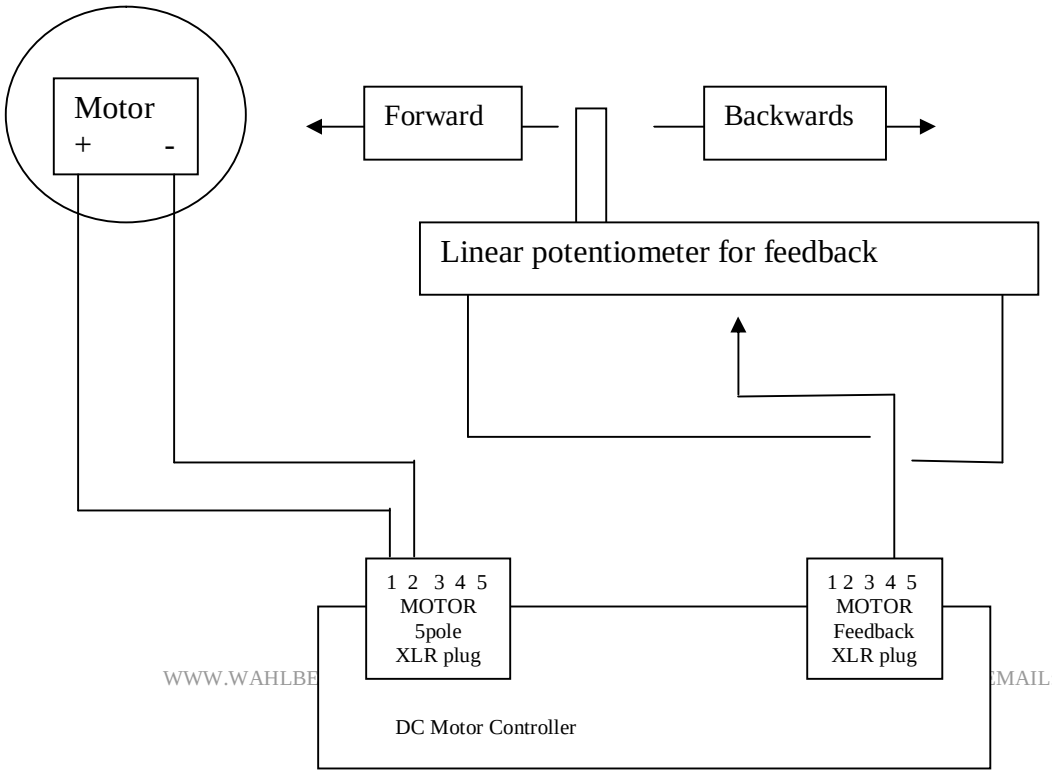


Fig. 5 – Potentiometer connections in the MOTOR plug

Connection of a linear potentiometer to the MOTOR plug.
Used at positioning in mode 4 –5– 6.



The pulse as reference.

The impulse is connected to impulse 1 and impulse 2 on the Motor Feedback XLR plug.

With pulse feedback the position must be reset at start.
The position is reset by running the motor backwards (DMX channel 4) until the wanted back position is reached. At this point channel 4 is set on 0 and the back position is reset. You can benefit from using the rear end limit stop to reset up against.
The movement area is set at channel 5. This is done by running channel 5 over zero, thereby the motor is running forward. When the wanted maximum position is reached, channel 5 is set on 0, the motor stops and the aria is set. Here the other end limit stop can be used with benefit.
The movement area is stored in the controlling box, and it is only necessary to adjust it once.

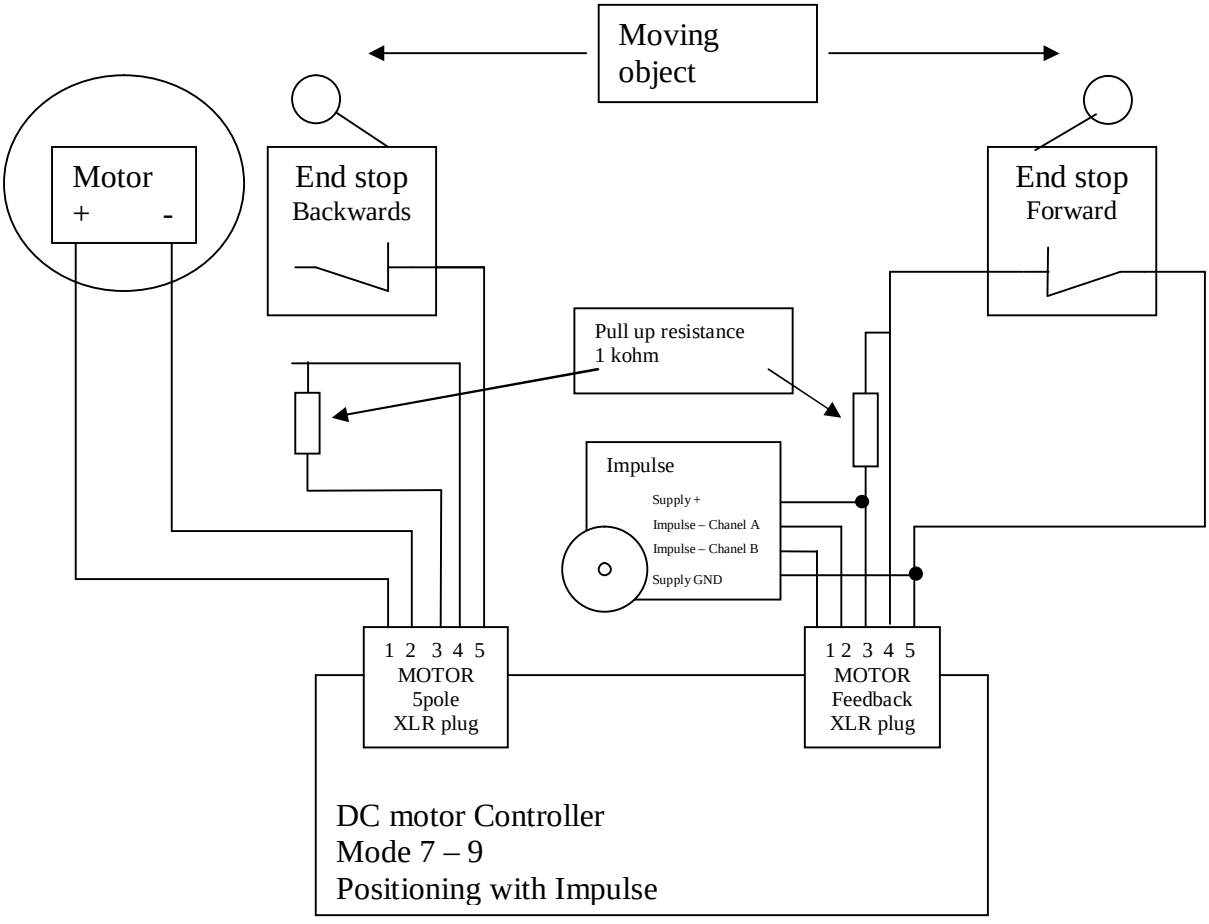
End stop.

When impulse is used for positioning, it is possible to use the two potentiometer inputs as end stops. End stop back is connected to potentiometer 1 input (Motor XLR pin 4) and End stop forward is connected to potentiometer 2 input (Motor Feedback XLR pin 4).

If an end stop is reached while running, the position will be reset to a position a small distance from the end stop to prevent the end stops from being activated during normal running.
Both end stops should have a 1 Kohm resistance between pin 4 (5V) and pin 3 (the end stop input). Pin 4 and pin 5 (GND) has to be connected to make the motor run. The Normally closed switch (NC) inside the end stop is therefore connected to pin 4 and pin 5.

Fig. 6 – End stop connections

End stop connections for the controller.
End stops are used in mode 7 – 9 where they are positioned by an impulse.



Mechanical connections

DC-motor guide

It is possible to use many different DC-motors with the controller box.

The power supply for the controller box is 24 volt. This means the voltage on the motor at maximum speed is 24VDC. When a DC-motor is connected it is therefore important that this motor is for 24 V DC or more.

If the rated voltage on the motor is less than 24 volt, it is important never to run at maximum speed. Please be aware of the motor, if it should become very hot or smell burned, it may be due to the motor and power supply having an incorrect voltage in relation to each other.

DC-motor with potentiometer

When you want to use positioning of the motor, it is important to use an appropriate potentiometer. This must be understood in the sense that the motor and the potentiometer, must fit mechanically, so when the motor is running the potentiometer follows along. The outer position of the motor must also be the outer limit of the potentiometer. In this way the potentiometer is used as a reference source to tell the controller box where the motor is located, so it can make a properly positioning of the motor.

DC-motor with pulse

The motor and the impulse have to be able to follow each other mechanically when the motor runs. The impulses should follow the DC-motor forward and backwards.
In this way the controller uses the impulses for counting where the motor is and thereby it is able to position the motor correct.

MODE functions

To use the controller box the MODE must be set. Each MODE setting has a given function, with a basic use of the DMX channels.

MODE 0

Free Run

The motor runs freely, without positioning, with regulation of speed and direction.

DMX channel 1: Direction setting.

0 – 33%	Back
34 – 66%	Stop
67 – 100%	Forward

DMX channel 2: Speed setting.

0%	Stop
1 – 100%	Max. speed

Example:

DMX channel 2 is set at 50% (speed).
DMX channel 1 is set between 67-100%
The Motor run forward with the middle speed set at 50%

MODE 1 – 6

Positioning with potentiometer

The motor is positioned by a potentiometer in the motor plug, with regulation of the speed.

DMX channel 1: Position of the motor.

0%	Full backwards
50%	Middle position
100%	Full forward

DMX channel 2: Speed setting.

1-100%	Given speed
0%	Stop

Example:

DMX channel 1 is set at 65%
DMX channel 2 is set at 40%
The motor runs to the set position about 2/3 of full forward (65%), with a speed just below the middle (40%).

MODE 7 – 9

Positioning with impulse

The motor is positioned by a tacho sensor in the motor feedback plug, with speed regulation.

DMX channel 1+2: Position of the motor.

0%	Full backwards
50%	Middle position
100%	Full forward

DMX channel 3: Speed setting.

1-100%	Given speed
0%	Stop

DMX channel 4: Reset against back

1-100%	Reset backwards with speed 1-100
0%	Stop

DMX channel 5: Reset against forward

1-100%	Reset forward with speed 1-100
0%	Stop

Example:

DMX channel 1 is set at 65%
DMX channel 2 is set at 40%
The motor runs to the set position about 2/3 of full forward (65%), with a speed just below the middle (40%).

Getting started

If you are using the DC motor for the first time it is a good idea to read this, to learn how to get started properly and what to pay extra attention to..

Setting

Before connecting the controller box it is a good idea to set both the MODE function and the DMX start address. See more about settings in the **Settings** section**.**
In this section we describe running in MODE 2.

Connection

When the mechanical feedback is mounted on the potentiometer and it is electrical connected, both power and DMX can be connected as described in the **Connection** section**.**
Remember to test the positioning before the potentiometer is run beyond its mechanical limits

Positioning running

The desired position is set on the DMX channel 1 and 2, witch are the coarse and fine settings for positioning. 100% is the most forward position and 0% is the back position. Speed is set on the DMX channel 3, where 100% is max. speed and 1% is min. speed. DMX channel 3 must always be above zero (0) before the motor runs. This way it also acts as a main switch.

Errors

DMX error

At error in the DMX signal:
Check for wrong or loose connections in the DMX plug
Check that there is a circuit in the cable.

Error in the motor run

If error in the motor run:
Check that the connections of the motor plug are correctly made (pin 1 and 2)
Check that there is a circuit in the cable.
Use the test function of MODE 7 and 8, to check if the motor is able to run backwards and forward without DMX signal. See **MODE functions**.
Check that the motor is not dead. For example by disconnecting the motor plug from the controller box and instead connect the voltage directly to the pins of the motor. If the motor does not run, it must be changed.
Remember, *If you apply voltage directly to the motor, it should not exceed the rated voltage on the motor.*

Error in positioning

If error in the positioning of the motor:
Check that the motor and potentiometer are properly connected.
Check that there is a circuit in the cable.
Check that the potentiometer is not broken and has not been twisted further than its outer limit.
Check that the potentiometer mechanically follows the run of the motor.

Technical specifications

Power supply	**: Input 100-240V AC/DC adapter – output 24V DC.**
Motor	**: DC-motor 6 – 36 volt**
Max motor current	**: 2.75 A at 24V**
DMX control	**: DMX 512 / 3-5 channels are used**
DMX connector	**: 5 pole XLR male & 5 pole XLR female for chain connection**
Weight	**: 210 g.**
Dimensions	**: 45 * 90 * 150 mm.**